

Remarks

This amendment after final rejection accompanies applicants' Request for Continued Examination.

Applicants' Notice of Appeal was filed September 30, 2003. Subsequent to that undersigned attorney for applicants spoke by telephone with Examiner Hassanzadeh. It was noted that in the outstanding final rejection the examiner had commented "Claim 12 does not recite a supersonic jet expansion unit coupled to the discharge unit in order to predominantly filter in the metastable $N_2A^3\Sigma_u^+$ state to the substrate." Amendment of claims to recite the "filtering" of activated nitrogen states was discussed as a possible course to arrive at agreement on patentable subject matter. By this amendment, then, applicant has revised independent claims 12 and 36 in the fashion discussed with the examiner. Independent claim 12 now recites:

(d) the distance within the apparatus from the corona-discharge producing electrodes to the means to locate a substrate providing a transit time of the nitrogen traveling therebetween along the nitrogen delivery path exceeding the lifetime of activated nitrogen in states other than $N_2A^3\Sigma_u^+$, whereby those states are effectively filtered out of nitrogen reaching the location of the means to locate a substrate.

Similarly, independent claim 36 now provides:

(f) the distance within the apparatus from the corona-discharge producing electrodes to the means for locating a target semiconductor substrate providing a transit time of the nitrogen traveling therebetween in the collimated jet that exceeds the lifetime of activated nitrogen present in the jet in states other than $N_2A^3\Sigma_u^+$, whereby activated nitrogen in those states are effectively filtered out of the nitrogen present at the means for locating the target semiconductor substrate by their conversion to the $A^3\Sigma_u^+$ state.

Also, in response to a request by the examiner in the telephone interview with attorney for applicant, the accompanying pages 245 - 247 and 324 - 325 of "Gas Discharge Physics," Y. P. Raizer, Springer, 1991, are provided. These describe the characteristics of an arc discharge such as that used in the cited Capelli et al. article "Arcjet plasma enhanced vapor phase epitaxy

of GaN" and the corona discharge of the present application. The arc discharge of an arcjet plasma generator is a high current, low voltage discharge between electrodes. The corona discharge is a high voltage, low current discharge at one of a pair of electrodes that is a pointed electrode or narrow wire. However what is lacking in all art of record and nowhere so identified is the location of the target substrate at a sufficient distance from the corona source such that all energized states but the $A^3\Sigma_u^+$ metastable state expire prior to reaching the substrate. This, then, is the effective filtering to which the examiner refers in his comment regarding claim 12. This filtering can be designated finite-lifetime-predicated spatial filtering of electronically excited states or FLPS filtering of electronically excited states.

Claims 13 - 18 are dependent claims that incorporate by their dependency the provisions of claim 12. These claims are patentable with claim 12.

Claims 37 - 46 are dependent claims that incorporate by their dependency the provisions of claim 36. These are patentable with claim 36.

Claim 47 is an independent claim directed to the production of dielectric films, unlike any of the art of record. In addition claim 47 has been amended to recite:

- (g) a supersonic jet expansion region between the skimmer and the substrate location of a length to effect filtering out of relatively short-lived excited states of the reagent gas moving in the supersonic jet toward the substrate location.

Hence once again the claim recites applicants' novel and unobvious structure for, in effect, filtering out short-lived excited states during the passage of reagent gas of the supersonic jet to the substrate. This claim, it is urged, patentably differs from all art of record.

Dependent claims 48 -52 incorporate by their dependency the novel and unobvious provisions of claim 47. These claims are patentable with claim 47.


Claim 1 drawn to a nonelected method is here cancelled without prejudice.

Because no art of record teaches or in any way suggests the structural arrangement of the apparatus claimed in the three remaining independent claims, claims 12, 36 and 47, it is respectfully urged that these and all dependent claims in the application are now in condition for allowance. Favorable reconsideration of the application is requested.

The examiner's helpful suggestions in telephone discussions with him are noted with appreciation. Should the examiner have questions or recommendations regarding the application he is invited to call attorney for applicant or to email him at the telephone number and email address listed below.

Respectfully submitted,
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